

# W.S.G. Isaac Newton Internship Booklet



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# Introduction

Dear reader,

In your student life there eventually is a point that your study comes to an end. To prepare yourself for what comes next and to already get a taste of what it is like to be a real “burger”, an internship is conducted. In a three to four month period you learn how it is to be working fulltime and to be a part of really awesome projects. This is a great opportunity to see what you like and to work at really cool companies, all over the world. To make a wise decision, we have already gathered a lot of information specially for you! In this booklet, a great overview of experiences from students from different internship assignments at very diverse companies is presented. Well, what are you waiting for? Go and find your perfect internship!

In case you want to know more companies after your internship, the study association has created the Shadowing Days project for this. During this day you can tag along with an alumnus Mechanical Engineering for a day to see what it is like to work in a certain kind of field. Please take a look on the [website](#), or ask the commissioner of education (Noor).

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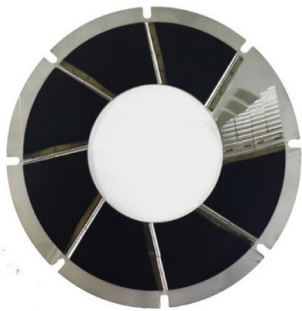
3rd edition

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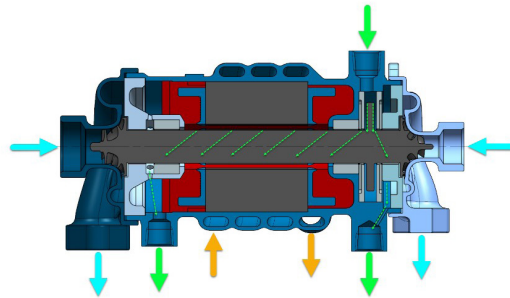
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## Aeronamic B.V.

Aeronamic in Almelo develops high-speed rotating components and precision parts for commercial and defence aircrafts, such as axial gas foil bearings in scroll compressors. During the internship a 2D pressure model of a axial gas foil bearing for the incompressible and compressible case are designed and validated by computing the Reynolds equation. For the incompressible case the problem is linear and can be solved using the matrix inversion method by vector-matrix algebra. For the compressible case a nonlinear problem is linearized using the Newton-Raphson method and the pressure is updated and converged with a successive relaxation method. The designed model can be extended with temperature and real gas effects and can be used to compute bearing characteristics in order to design new gas foil bearings.



*Axial Gas Foil Bearing*



*Schematic drawing scroll compressor*

## Alfen

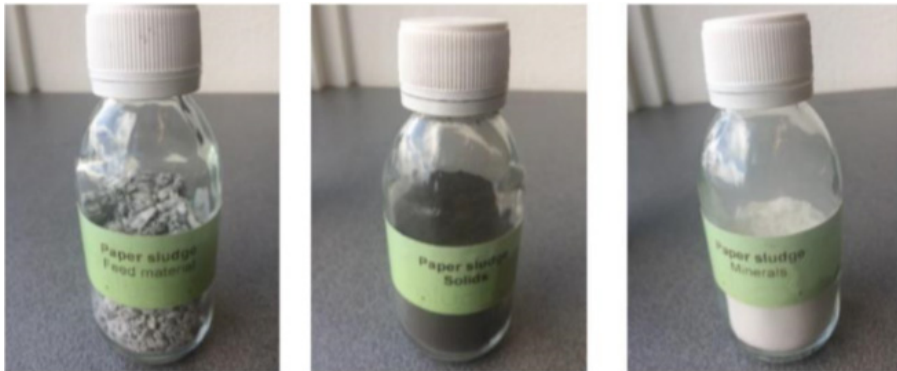
The internship mainly included the production of an availability model. For this, it was necessary to interact with different departments; Sales, R&D and service. The model helped sales with the calculations of the availability, which is used for the sales of different products. Next to the production of the model, which is necessary to know the failures on forehand, it was important to give insight of the failures afterwards. This was done by a monthly report on the different products already in use by the costumers.



## Alucha Management B.V.

Alucha is a start-up organization located in Arnhem (The Netherlands) that works on projects and technology which develop a circular economic business model and provide sustainable solutions. Currently, the company is working on process solutions to recover good quality minerals from the paper sludge feed (Figure a → Figure b → Figure c).

The main aim of my Internship assignment was to optimize the process parameters for the lab-scale test setup and work on improving the quality of the minerals as shown in Figure c. This 3-month internship provided a great learning experience and opportunity to work on a project in the industry. The company had a great working atmosphere with very helpful and experienced engineers.



(a)

(b)

(c)

## Ampleon Netherlands

Wide bandgap semiconductors are the answers to high power and high-temperature demands. When they are operated at these conditions, they generate a lot of heat and this heat needs to be dissipated to keep them functioning efficiently. Heat sinks are the devices that dissipate the generated heat. Die-attach material is the connecting element between the semiconductor chip and the heat sink. GaN is most often used wide bandgap semiconductor and the die-attach material that exists works with the hybrid heat sink. Copper is known to have better heat dissipation than the hybrid heat sink. When the die-attach material used for the hybrid heat sink is used for copper, the material fails the validation tests. To solve this problem key parameters causing the failure are identified and then a case study is done selecting one of the key influencing parameters. Researches and markets are also investigated to check for a possible solution. Ideas are generated based on the information from the market, researches and case study. A list of the most promising ideas is created. Validation and implementation of these ideas as the solution would be the next step.

*The image for the setup cannot be included due to the confidentiality*



## Airbus

The student performed an internship assignment at the capability development department of Airbus Bremen. The subject of the assignment was on the modeling of the performance impact of ice on a transport aircraft in landing configuration. The assignment was performed using computational fluid dynamics software to compare data of wind tunnel experiments with computed results. Airbus Bremen is the second largest site of Airbus in Germany, the largest being in Hamburg. Approximately 4500 people work at Airbus Bremen and the capability development team consists out of approximately 10 persons. The company culture at Airbus is informal and it is possible to ask questions to your supervisor without making an appointment first, quite similar to the open door policy on the University of Twente.



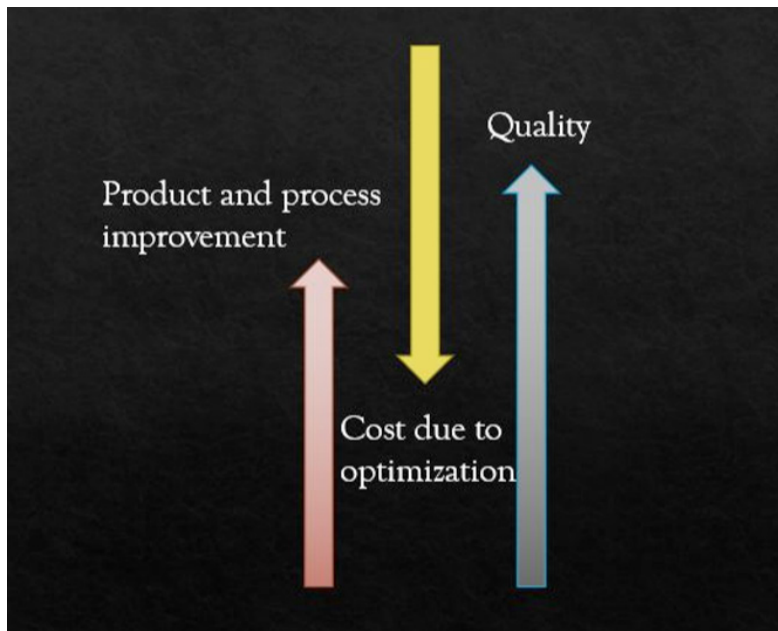
## Brink Climate Systems

Brink Climate Systems in Staphorst, The Netherlands, has offered me an internship opportunity at their R&D department. During the internship a project was assigned to research methods for designing a volute of a fan. One design was then 3D printed and tested in the lab of Brink Climate System for verification. The volute was tested on its performance, but also on its sound production using the echo chamber that Brink Climate Systems has installed in its lab. Brink Climate Systems has offered a lot of support during the project with their expertise available at their R&D department. Having an own lab was a huge advantage for doing this project.



## GGM Gastro

GGM gastro is a German company which is one of the largest providers of commercial kitchen equipment based in Ochtrup, Germany. The company offers a wide variety of catering equipment, dishes to dishwashers to combi steamers with Android control panel. The company has direct contact to manufacturers from Germany, Italy and overseas; they can offer an assortment with lowest prices guaranteed. The aim of the internship assignment was to improve the quality of the products by evaluating the failures and improving their components by keeping the cost of optimization in mind, also designing new unique features for current equipment in the company. FMEA analysis was used to find the critical components and SolidWorks was used to create the designs and/or design ideas for the products. Additionally, by doing this, a knowledge base regarding the products was made which will be very useful for the staff of the company and the administrator board in order to make decisions regarding the products.

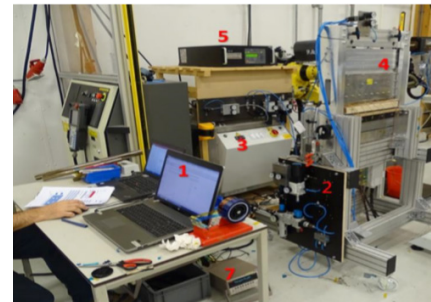


## GKN Fokker Aerostructures

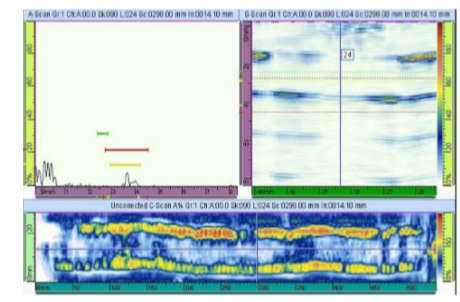
GKN Fokker Aerostructures is a prominent name in the Aerospace industry. The R&D department of the company is situated at the company's Hooogeveen plant. They are suppliers to the big aviation giants like Airbus, Boeing, Lockheed Martin etc. R&D department is involved in cutting edge innovation in the composite industry, mainly focused on Thermoplastic composites.

Welding of the thermoplastic composites is possible, thanks to their re-shaping property at elevated temperature. This bonding technique eliminates the use of rivets or bolts, which add more weight to the overall structure. It is still under development and needs further improvements as well.

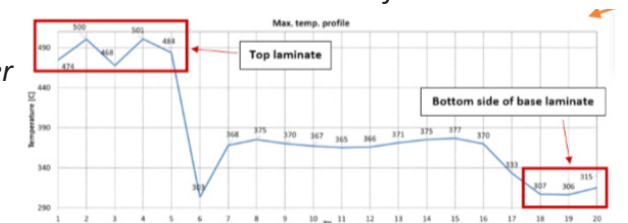
0.5 meter conduction welding tool was optimized to achieve required temperature at the weld interface. Effect of number of tool parameters were checked to get the optimum result. Finally, the required temperature was achieved at the weld interface. The internship was concluded with the recommendations regarding pressure distribution and other problems found within the tool.



- 1 Laptop
- 2 Pneumatic system
- 3 Cooled water feeder
- 4 Weld tool head
- 5 Induction heating systems
- 6 Ambrell work head
- 7 Keithley data-logger



NDI result of an actual weld



Max. temp. achieved during actual weld



## Global Himalayan Expedition

Started in 2014 by Mr. Paras Loomba (CEO), GHE works in the domains of sustainable tourism, solar micro-grids, digital education and livelihood creation for the inhabitants of the Ladakh and Kargil regions of the Indian Himalayas, one of the coldest and most remote parts of the world. Every year, GHE gathers tourists from across the world and conducts impact expeditions to remote centuries-old communities living in these regions, and deploys solar micro-grids, thus bringing the critical and basic facility of electricity and light to these places. In the last six years, GHE has electrified 101 villages with 1286 travelers from across the globe. Working for GHE brings with it the responsibility and the adventure of traveling to remote villages, conducting surveys, assimilating the required hardware, and then deploying a micro-grid to bring electricity to the village. It is a job that requires dedication, ingenuity, capacity to handle uncertainty and spontaneous work, harsh Himalayan climates, and, above all, a desire to push oneself to do good for those who still live in darkness. The benefits of the internship range from developing practical on-ground knowledge of the working of solar micro-grids in extreme high-altitude climates, to getting the opportunity to interact and live with one of the most beautiful cultures in the world and the satisfaction of engaging in truly life-changing impactful work.



## HoSt

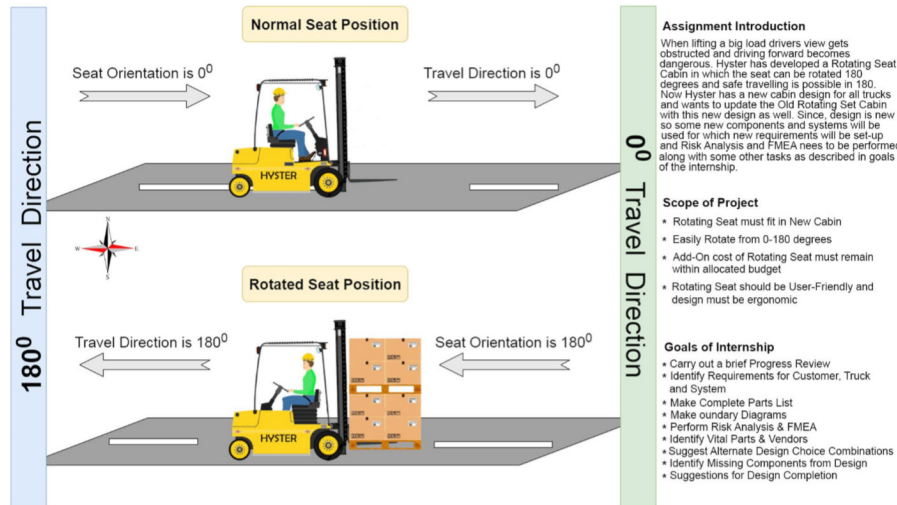
HoSt is a company located in Enschede. Activities range from biogas generation and upgrading to heat and power cogeneration plant design. The focus of the internship was on the latter subject, especially on furnace control and boiler design. Several methods to improve the control of the combustion process were investigated. Besides that, the possibilities with an unused software package were examined, and multiple improvements on boiler design were proposed.

The company was very open to help me from the beginning. Employees are very accessible, and there was a lot of room to learn about specific topics of interest. There were multiple opportunities for site visits as well, which turned out to be very instructive. This made the whole internship an enjoyable and productive experience.



# Hyster-Yale

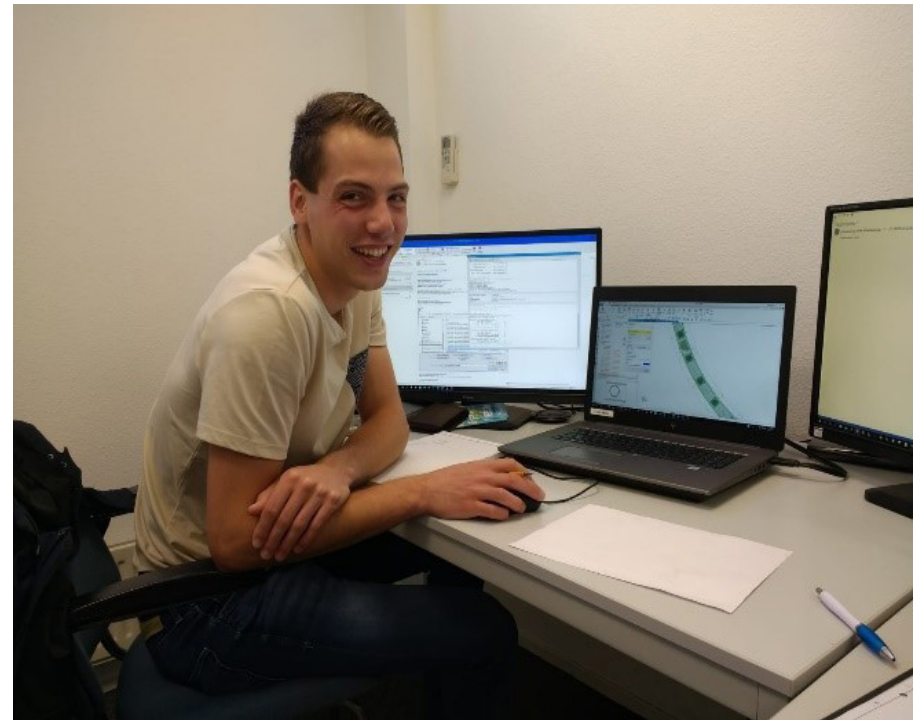
The internship was performed at Hyster-Yale in Nijmegen, Netherlands and the overall experience was amazing. The supervisor, engineering team and supporting was very friendly and helpful.



# Intamin Holland B.V.

I did my internship at Intamin Holland B.V. which is a company located in Apeldoorn, the Netherlands. The company is specialised in structural-, dynamical- and fatigue analysis of dynamically loaded structures. These structures include roller coasters, free fall rides and giant wheels. Intamin Holland closely works together with Intamin Amusement Rides, which is one of the largest amusement rides manufacturers in the world.

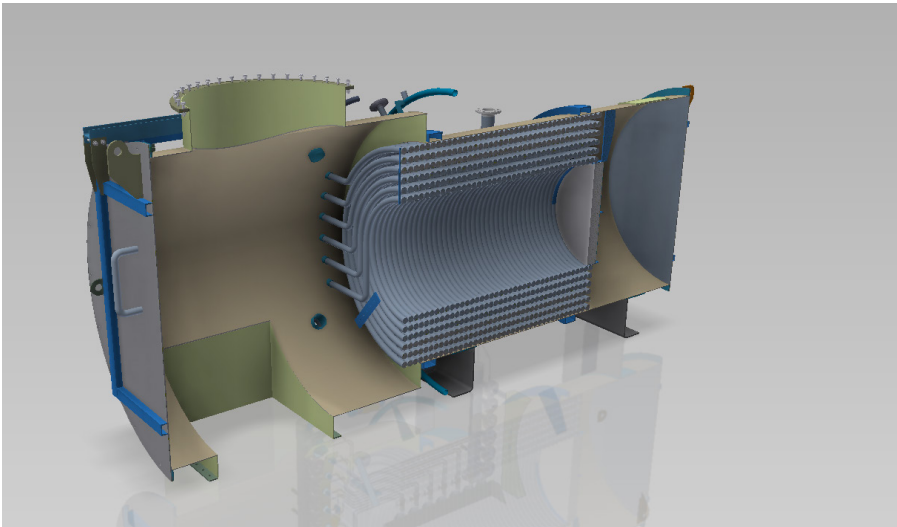
At Intamin I mainly did mechanical analysis on structures included in a newly developed ride. The models for the Finite Element Analysis were made in Siemens NX. Static as well as fatigue analysis had to be performed for these structures. Besides, I also did some dynamical analysis for which I wrote a small piece of code or had to adjust some code in Mathcad.





## KARA Energy Systems

The internship was within a small company specialized in bio energy systems located in Almelo, the boilers vary from 250kW up to 15MW. The objective of the internship was to design a model of a new thermal oil boiler. The student was working on the assignment individually during the internship, although the student was able to use the wide selection of spreadsheets models already available in the company. In addition to this the student had to come up with a new design to prevent heavy fouling of the inside of the boiler. The figures shows a thermal oil boiler.



*Thermal oil boiler*

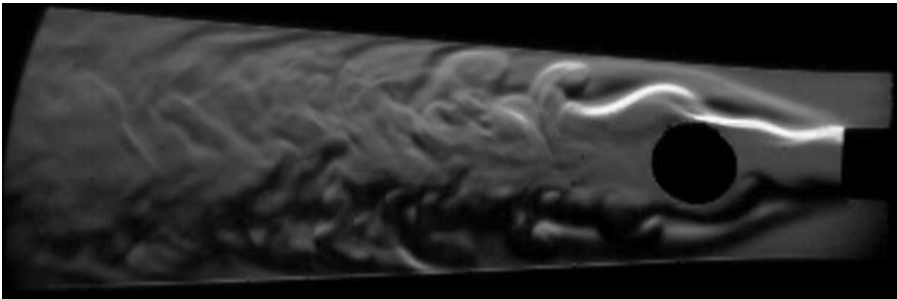
## Maurer Rides

Over the past years Maurer Rides developed a versatile powered coaster type called the Spike® Coaster. Using a mechanical interlocking type of propulsion and an electric motor, high accelerations can be realised with high reliability as no dependencies on friction surfaces are present. As full control over the speed of the coaster car at any point on the track is provided, this coaster type opens new possibilities in terms of layout design and operating conditions. The current Spike® Coaster utilizes a small 2-person car resembling a street bike, which limits capacity and safely allowable G-loads on the riders. In this report, a conceptual design study is carried out on a new coaster platform, using the same mechanical interlocking propulsion concept. This platform will be based on a more traditional 2-running rail design with a central spine, unlike the 2-running rail vertical design without a central spine of the current Spike® Coaster. Three design concepts are developed in the report, based on three different transmission types; direct drive, a belt drive and an in-house “kettenantrieb” conceptual drivetrain. For the three different concepts, various calculations are made to determine the required specifications of several key components. From these specifications, manufacturers and specific parts were examined and for each drive concept a product concept was developed. Each resulting concept has its key electrical components, braking components and drive components selected based on these specifications, resulting in a theoretically feasible design.

## Nefit Bosch

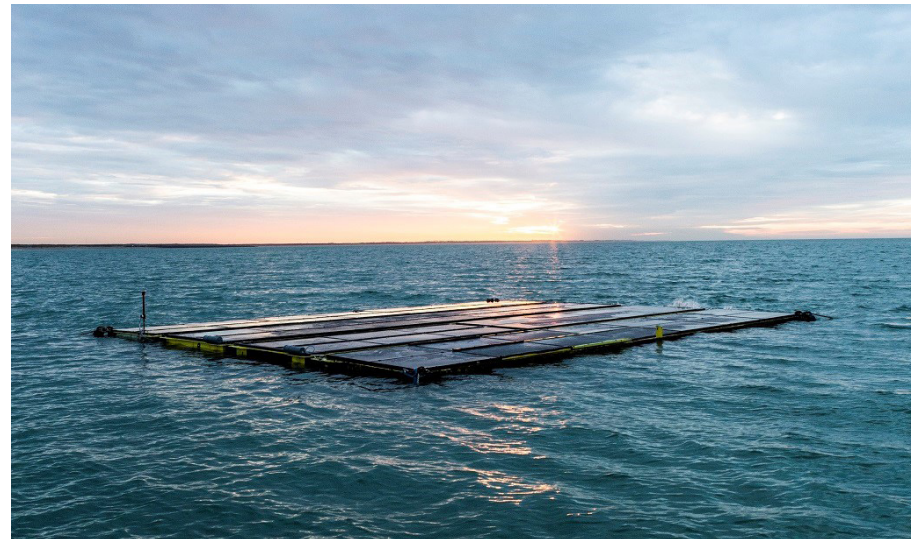
In a condensing boiler, gas is mixed with air inside a Venturi to obtain a homogeneous combustible mixture. For the new hydrogen combusting boiler being developed at the R&D department of Bosch Thermotechnology in Deventer, the mixing process takes place just before the gas is injected in the burner. It is desirable that this mixing process happens over a short length, ensuring that the flammable hydrogen-air mixture does not travel large distances before combustion.

The mixing process inside the Venturi is investigated using the Schlieren flow visualization technique, that utilizes the effect that a fluid's density influences its refractive index. Several flow velocities were tested and some obstacles were added in the Venturi to investigate if



## Oceans of Energy

During the internship at Oceans of Energy at Katwijk aan Zee, a variety of assignments were carried out. Besides small tasks, such as helping with deployment trips (actually going with a speedboat to the floaters at sea) and helping out in the construction hall, assembling the floaters, the main focus was on three big assignments: First, writing an algorithm to computationally optimize the floaters by means of a nonlinear constraint optimization. As a second project, OOE put the intern in charge as a lead engineer on a project with lots of third parties to experimentally measure forces in the floaters. Lastly a script was written to efficiently and effectively read out raw kinematic data provided by the monitoring systems on the floaters. This was a perfect way to meet the start-up culture: from moment one, the intern got involved in the disciplined team, there were a lot of social activities organized and could enjoy the freedom they provided.



## Off-Grid Factory

Realising off-grid energy systems is a big but very interesting challenge. The internship took place in the capital of the Netherlands, Amsterdam, at a company called The Off-Grid Factory. A small but quickly growing company with a lot of different possibilities. This company realises off-grid energy systems. This internship was about managing the project from the start up until realisation. This included the commercial part at the beginning, performing calculations, planning everything and finalizing the project. The project manager is the contact person and the one responsible for everything. To gain extra knowledge on the different products trainings were followed and existing systems on site were visited.

To conclude: Interesting internship on an at the moment very actual topic.



## PVC Group

PCV Group is a technical consultancy company and is located at the Oldenzaalsestraat in Enschede, relatively close to the University of Twente. PCV performs product development and research for multiple large international companies. At the moment about 50 people are employed. The company is known for its expertise in dispensing and dosing in its broadest sense. In specific a large knowledge about coffee machine components is built over the years. The possibility to assist in multiple projects is offered, instead of working on a personal assignment which is isolated from the ongoing projects. In this way the most realistic experience for the work in a consultancy company is given. PCV gave the opportunity to develop new and personal skills and learning goals.



## Philips Drachten

Philips Drachten develops high-quality innovative, consumer-oriented products for a worldwide market. Rapid Prototyping Department has world class facilities to make prototypes of any kind with most modern production techniques and machines. It has almost all new technology (even different metal 3D printers) and machines to make new product prototypes as per requirements.

The work during internship was to do a conceptual and feasibility study of the manufacturing concept called small series production or low volume production. The student carried out this task pretty well and was really appreciated by the supervisors.

The atmosphere in the company is very good and open-minded and colleagues are very friendly and helpful. It is a very good place for a mechanical engineer to see, touch, experience and learn many new things. Everything you learned about the production technology can be seen for real here. Knowing Dutch is an advantage as most of the colleagues are Dutch and can actively participate in leisure talks.

Drachten is a small town and all the necessary shops are nearby. However, the biggest disadvantage is that it is far from University and there is no railway station in Drachten and nearest railway station is around 40 minutes in bus. So, it will be difficult and expensive for international students (as we don't get student travel discounts) to travel around in buses.



## Prodrive Technologies

Prodrive technologies, located in Eindhoven, is a producer of a wide range of electronic and mechatronic solutions. They produce almost everything in house using the latest production techniques, some of which they have developed themselves. The internship assignment focussed on the quality control of Printed Circuit Boards. A solution needed to be found to produce a part of the automated test machine within 24 hours in house at Prodrive.

Because Prodrive is present in a lot of different market segments there will probably an assignment which is suited for you. During your internship or graduation at Prodrive Technologies you will be received in our young team as if you are a full-time employee.



## Qirion

This internship is done in the Energy transition, Circularity and Gas department at Qirion, part of Alliander, in Arnhem, Netherlands. It is a great place to have an internship if you want to experience what can be done in the energy transition in a company who looks at long term plans, not just about making money this quarter. You are given freedom in your assignment and help and interest from the people working in your department. Your work will be mostly on computers and not in labs. An example for an assignment is an analysis of the impact on energy, area and material use for the construction of an energy production and storage island, shown in the picture below.



## Scania

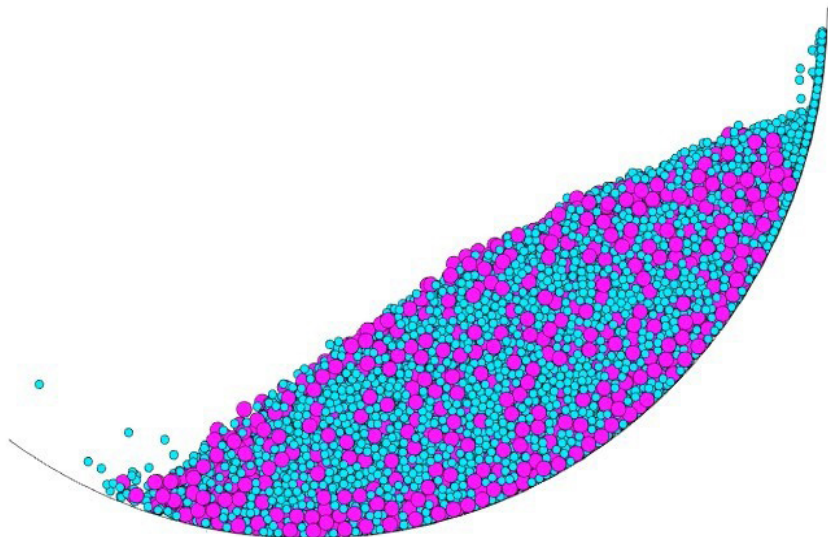
Scania is a global company, offering sales and services in more than 100 countries. Due to the rising interest in sustainable transport, Scania is looking into new materials. Composite materials are an interesting choice, because of their favourable properties in this area. The increased use of composites can be seen in Scania's recent public release of the NXT bus.

This internship focussed on differences between metal and composite bolted joints, the failures that can occur in composite joints and the modelling of these joints. All of this was done while keeping an industrial application in mind, which meant that simplifications had to be made and substantiated. The internship was conducted at the Scania head office in Södertälje, Sweden. Scania provided accommodation, a work area and a number of great colleagues, with which many activities were done after working hours.



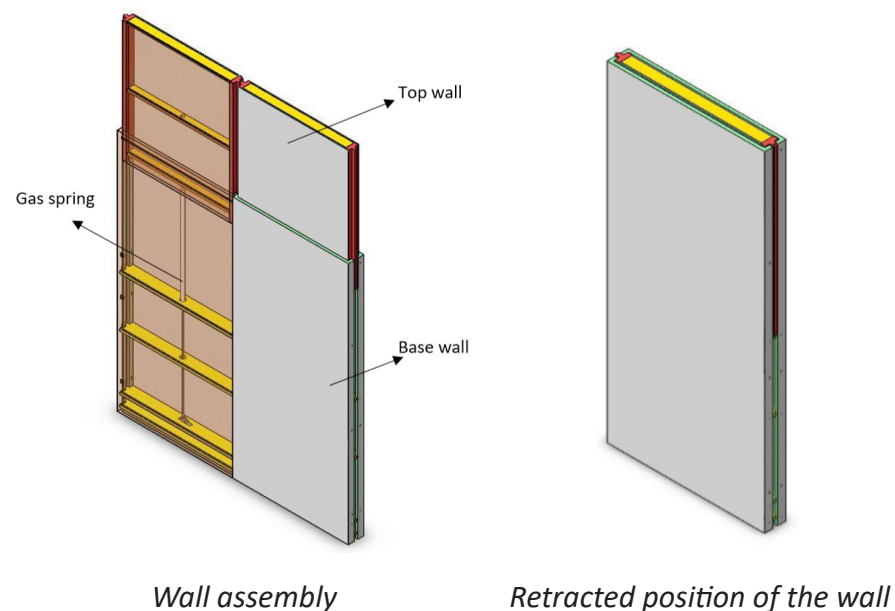
## SINTEF

The research company SINTEF, based in Trondheim (Norway), receives questions from companies and governments on technical problems in a very broad range of disciplines. One of these questions came from artificial fertiliser producer Yara. The process used to make solid fertiliser granules was running inefficiently with fluctuations in size distribution and production rate. The intern worked as part of a project group to model the process in a Computational Fluid Dynamics model. Knowledge was gained on simulation software and particle theory. The working environment at SINTEF was very relaxed with good supervision by the project. Engagement with the client was part of the job as well. Next to this, the city of Trondheim provided a great place to live.



## SKEPP

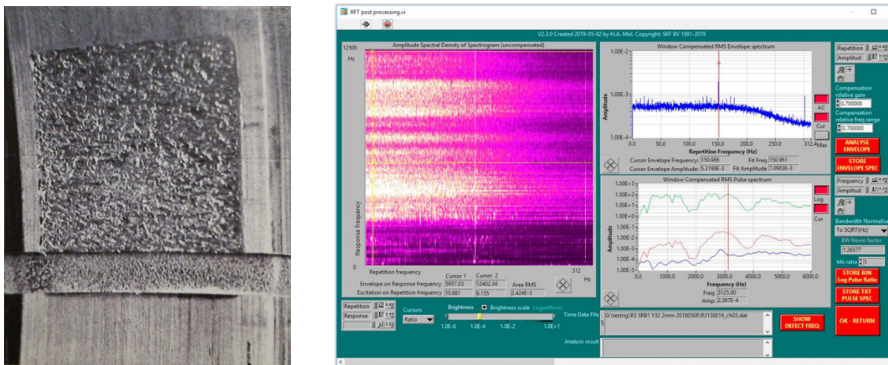
The internship was in SKEPP BV located in Albergen, Netherlands. They connect the landlord to the clients either by renting/leasing for a short time or buying. Goal of the internship was to develop a flexible wall, that could be installed in any office space irrespective of its size. The mechanism is based on the motion of gas spring attached on the base wall. Gas spring tends to move in vertical motion till it reaches the ceiling. Wall are placed next to each other based on required length. This wall can function as solution to temporarily divide the office space and save a lot of time, money and resources. This assignment could be interesting for someone who wants to a part of product development team.





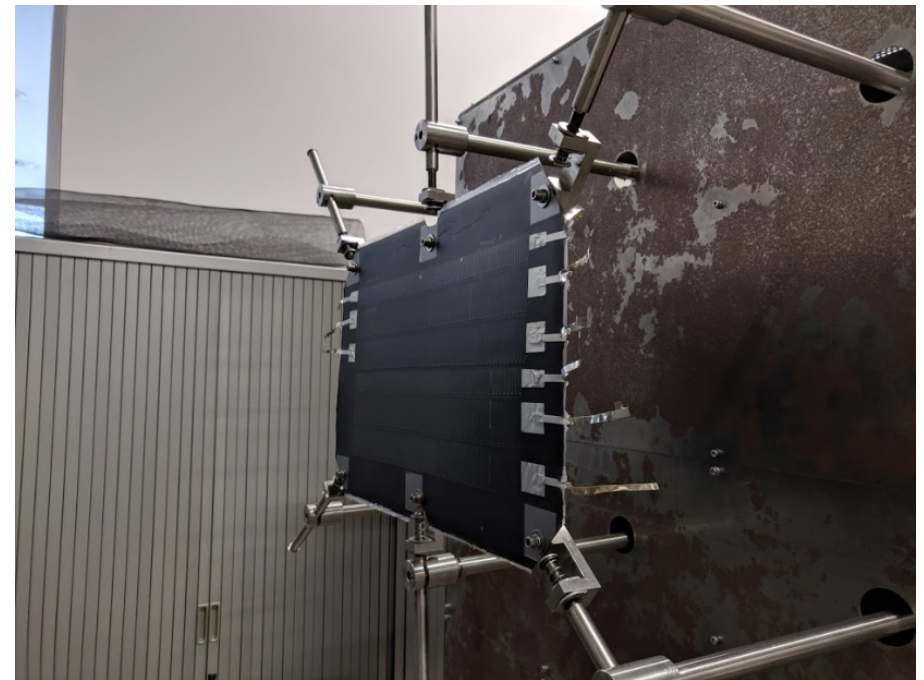
## SKF

The internship was conducted at the company SKF located in Nieuwegein, Utrecht, the Netherlands. SKF wants to apply condition monitoring to bearings which is possible through vibration analysis. For this, different vibrations were measured on train wheels with defect bearings. These signals had to be analyzed using patented LABVIEW codes. The results were then further analyzed in Excel and presented in graphs. Finally, all results were used to determine the success rate that indicates how successfully a defect can be determined. The experience at SKF was special, very educational and a lot to see in the laboratory. Nice atmosphere by friendly employees and pleasant meeting during the break at the restaurant. SKF rewards well and arranges housing. The internship at SKF was the best period of the study.



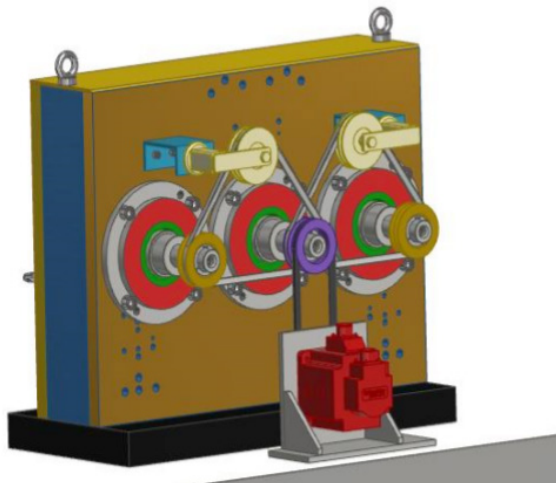
## Solliance

Solliance is a company which focuses on thin film photovoltaic technology. The internship was carried out at the Solliance facility in High Tech Campus, Eindhoven. The four-month internship focused on mechanical degradation of thin film solar modules in the offshore environment. Below, you see a setup nicknamed "dancing beetle". During the internship I had to work with this, and a handful of other equipment. Overall, the internship was mildly challenging, and the colleagues at the company are all very helpful people. The company also generally has a lot of other interns, so it is not hard to make friends quickly. The city of Eindhoven is great too, and there are always some events to keep you busy when you are not working.



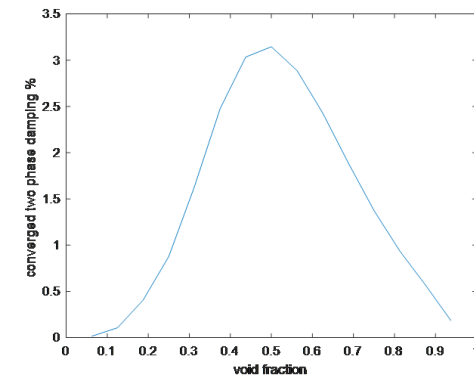
## Thielenhaus

Koellmann Gear Company today is a leading manufacturer of special gear boxes, the main company product in the contemporary times is the extruder gear box for plastic processing machines. A gear box in very basic words can be described as set of gears mounted on shafts with a casing, a gear box uses several moving parts and accessories so that it can function properly. Any device with moving parts needs lubrication to minimize friction and for a better service life. With lubrication also comes the need of confining the lubricant inside the gearbox, this job is done by the oil seals. In spite of using the seal rings, leakage is observed after certain period of time, The scope of this assignment is to investigate the reasons of leakage from the gearboxes by understanding the interaction between the sealing lip of the oil seal and the radial shaft surface, this is a delicate tribological system and a lot of factors contribute for holding the system in place for instance material quality of the seal rings, presence of lead on the shaft surface, shaft heat treatment method etc. The assignment therefore consists of a task of designing a test rig to study the behaviour of oil seals with the shaft interface, in order to determine the causes of leakage from the sealing system.



## TNO

The internship was on mathematical modelling of multiphase damping of pipes. The vibration of pipes due to multiphase is an important phenomenon that has to be controlled in order to make industrial pipelines safer. The internal flow can impart both fluctuating forces and damping to the pipe. Both have to be studied in order to measure the stress generated at clamps and in welds. In this research the factors affecting the damping behavior was investigated with theoretical models. To understand the phenomenon of pipe damping due to internal multiphase flow, the analysis was split to two domains which are predicted to influence damping, namely time variation in the system and the fluid dynamics of bubbles and slugs inside the system. These were further split into subparts. Dampings were successfully explained by developing mathematical models of mass varying with time system, bubble viscous dissipation, longitudinal viscous dissipation, coriolis force and slug flows. The internship was done in the beautiful city of Delft. The student lived in the city of Den Haag. On most days he had to cycle from Den Haag to Delft a total of almost 24 km which kept him super healthy. From multicultural bustling city of Den Haag to beautiful outskirts of delft with amazing waterways to the main wonderful city of Delft, the bike ride had everything. Who could get bored of such a bike ride, right?

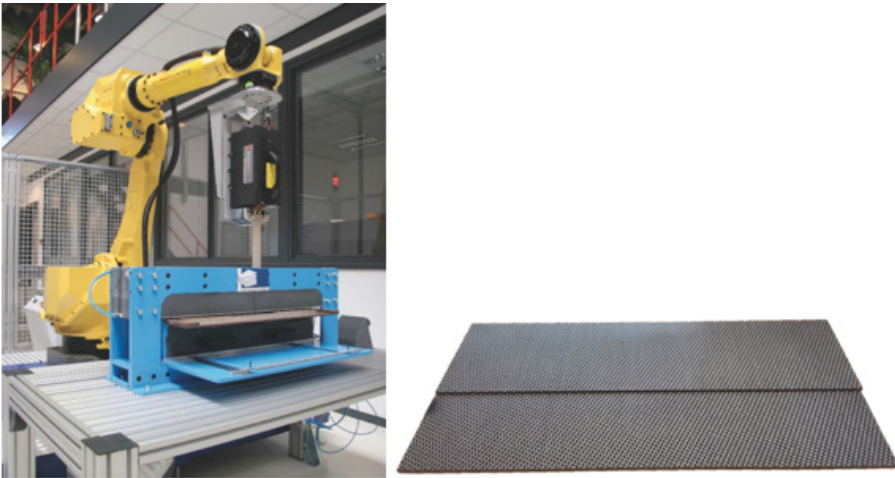


*Damping of pipes due to centrifugal forces*

## TPRC

The internship was at the thermoplastic research center (TPRC) in Enschede the Netherlands.

The internship was about induction welding of thermoplastic composites. The aim of the project was to relate external signals to internal signals and to establish a relation between the two. During the internship he got to work with large machinery and composite materials. The set-up needed to be improved and tests needed to be performed. The organisation consisted of a lot of relatively young people which meant a nice working environment. There was enough freedom in the work he did and overall it was a nice environment to work in.



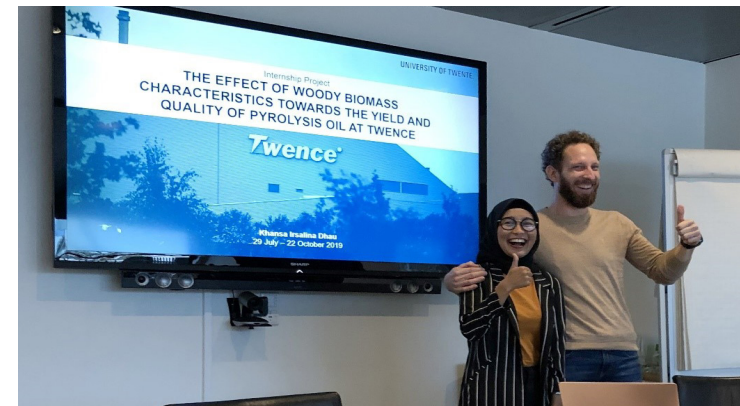
## Twence

Twence is the largest renewable energy provider in the Province of Overijssel. The energy sources are solar as well as biomass, such as municipal solid waste, wood waste, forest residues, and organic waste.

The student worked in the Innovation & Project (I&P) department, whose main task is to develop new ideas for improvement or business expansion. The internship project goal is achieved through literature review, data analysis, interviews, and in the end resulted in a calculation tool to estimate the yield and quality of pyrolysis oil. There was no laboratory experiment conducted by the student, however the student used laboratory analysis data from the company to create the mathematical model. The project is a good implementation of acquired knowledge from the university.

The student had a positive experience working at Twence because she received a lot of support from her supervisor and other colleagues. Her supervisor provided her with excellent guidance throughout the process by doing frequent discussions and introducing her to internal and external stakeholders. The student felt that her work is appreciated.

The working hour is stated in the contract as 8:30 – 17:00 on weekdays, but in actual it's quite flexible. Ability to speak Dutch in an informal situation would be highly useful in the company.





## University of Adelaide

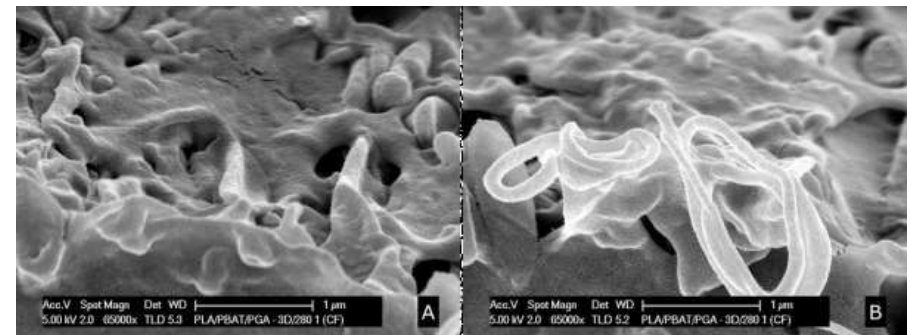
The internship was in Australia at the University of Adelaide. The goal of the internship was to develop a controller for a snake robot that can control the shape of the snake. Instead of using the Newton-Euler equations of motion the controller should be build using another description of the snake (the port-Hamiltonian description). The assignment was very interesting and challenging. My supervisor was a very nice person and she was always willing to help. The down side is that all the work (derivations, modelling and simulations) was behind a desk in a not so exciting office. Going abroad for an internship has a lot of very exciting opportunities but can and will challenge you as well. To end with, Adelaide is an awesome city and Australia is an amazing country!



## University of Auckland

The student went to New-Zealand to do her internship at the University of Auckland. She had got an assignment at the Centre for Advanced Composite Materials about 3D-printing of plastic coronary stents. Because the mechanical properties of polymers are not good enough, other techniques are used to make the polymers stronger or to change the stent design. She was working with several polymers, extruders, drawers, 3D-printers, SEM and several testing machines. With SEM she tried to show that after 3D-printing of a drawn polymer-polymer filament (it was drawn to create micro-fibrils) there were still some filaments present in the material.

When she had time off in the weekends, she went traveling a lot to explore the beautiful country with the friends.



## University Pompeu Fabra

This internship was conducted abroad in the city of Barcelona, in Spain. The work was performed at University Pompeu Fabra, together with a professor from the Economics and Business department. The internship consisted of helping the professor create and validate algorithms using software (CPLEX) in order to optimize the production of crops in Vertical Farming sites.

Barcelona is an amazing city, with warm weather until the end of October. There is everything there: beaches, good food, places to go out, etc. Most locals speak only Spanish, but there are many English-speaking internationals around, and they can be found on associations such as ESN. The university is quite small, but has good infrastructure and a huge library, ideal for working and studying.



## Vernay

Vernay Europa B.V. situated in Oldenzaal (The Netherlands) is a subsidiary company of a US based company Vernay Flow Control Solutions. The company design, develop and manufacture different types of flow control products based on the customer's demand and requirements. The products manufactured by Vernay Europa B.V. has application in the field of automobile, medical, printing, small engines and consumer products. The aim of the internship assignment at Vernay Europa B.V was to create a tool that helps them to estimate the capacity required in the pre-/post- treatment department of the company based on the customer's orders. Microsoft excel was used to create the tool to estimate capacity required for a given time frame. The output of the tool shows the capacity required in terms of machine hours, man hours and number of shifts required to complete the orders for a given time frame. The company can use the output of the tool to do capacity planning for the pre-/post- treatment department.



## We4Ce

Research was done on the effects of increasing tilt angles on the behavior of a 2-bladed-rotor (2B68) with the use of RFlow3D by the company We4Ce. This was done by doing self-set-up simulations, reviewing the results and writing code to find behavior efficiently. This behavior had to be compared with other solvers to make comments about the results themselves and about the usability of other, faster, but less complicated solvers.

It was expected that work was done at the office during normal office hours so that everyone is always present for questions, feedback or sparring of ideas. Working independently is expected and really diving in the research matter is encouraged. This creates a very enthusiastic, hard-working group of engineers who do top of the art research.

## WILA

The internship was with the press brake company WILA, Lochem Netherlands. The company produces and develops tooling and tool holders for press brake machines (like Safan or Amada). The assignment is concerned with the so called wander behaviour of the upper tooling. The press brake technology is developing to be more accurate and therefore the behaviour of the tools during press brake operations need to be identified. Specifically, the behaviour of a tool when being clamped and unclamped. The student analysed the behaviour and developed a test to check whether her assumptions are substantiated. The location in Lochem is the main office of WILA and is therefore also one of the production locations. The time spent at WILA was good with a nice assignment and a good atmosphere.





## Xsens

The student did his internship in Enschede at Xsens. Xsens is located at the business area on Kennispark, so very close to the campus. They produce Inertial Measurement Units (IMUs), sensors which are able to measure its position and orientation. This can be used for 3D body motion capture. Thijs focused on another method for motion capture: stretch sensors. He used flexible rubber sensors which change their capacitance when they are stretched. He attached them across the knee and elbow joint and used them to measure the joint angle. Then, he compared this measured joint angle to the joint angle received from the IMUs of Xsens to validate them. Xsens is a company with many young employees, which is a really good and helpful environment for an internship!



## Zero Emission Fuels B.V.

Zero Emission Fuels B.V is a start-up company in Delft, which is designing prototypes for small scale methanol synthesis plants, where carbon dioxide from the air reacts with hydrogen produced by photovoltaic electrolysis of water. The company consists of students from various disciplines working in their respective teams in designing the subsystems. Team integration, in short Team INT, focuses on designing circuits and integrating them to the sensors. The other teams are deals with carbon capture, alkaline electrolysis, methanol reactor and distillation, life cycle analysis and compressor. This internship provides students with hands-on experience with various equipment and gives an opportunity to think by themselves in finding solutions. The city of Delft is a small student city with all the provisions in reach.



## BAM Energy Systems

In the built environment there are plenty of opportunities to realize energy savings, increase sustainability and well-being of people. BAM Energy Systems (BES) has been successfully working on this for many years. In this way they deliver and manage energy and sustainable energy systems for offices and homes. One ongoing development is the possible implementation of hydrogen within the built environment. This was also the focus of the internship. Hence, a case study was conducted on the implementation possibility of hydrogen as a substitute to natural gas within the built environment. To evaluate this possibility, various configurations of the energy supply systems of terraced houses and apartments were analysed. The Royal BAM Group, especially the department BAM Energy Systems was the ideal place to do such an internship.



## Cyprus University

For the internship at Cyprus University of Technology, the student worked on a project called PROGNOSIS. A main goal of PROGNOSIS is to create a solar energy forecasting tool to predict the output of PV systems using only past production data without the need for any other data such as weather conditions. Naylani was responsible for preparing large amounts of PV data for use in training a long-short-term-memory (LSTM) artificial neural network, which is a form of machine learning model. She then trained the LSTM model on the data and tested its forecasting capabilities. She found that her single-layer, simpler model, better predicted the true output of the PV system than a previously created 5-layer, more complicated model, suggesting that the problem is simpler than the researchers originally thought.

## DWA

The internship is done at the company DWA. DWA gives the building construction advice about sustainability, constructions/installations and is working on the energy transition to make neighbourhoods natural gas free. The goal of the internship was to find out if the city hall of Eindhoven could be made more sustainable. DWA is an interesting company, the employees are kind and friendly. There are no secrets for you and you are welcome to watch every meeting internal and external. So it is recommended to call them if you are looking for an interesting internship in the building construction environment. The company has 4 offices, which are situated in Amsterdam, Gouda, Veenendaal en Rijssen. This internship was done at the office in Rijssen.



installatie- en energieadvies

## Hankamp Rehab

Hankamp Rehab is a company that is focused on development, production and marketing in rehabilitation. The internship was about the redesign of a hand orthosis for stroke patients. A common problem that stroke patients experience is hypertonia which leads to high finger joints stiffness. A part of the internship was to find a relation between the stiffness of the three finger joints, and the other part was to improve the design of a hand orthosis. The current orthosis is already an improvement of an existing design, but it is still quite bulky and heavy. During this internship, some next steps for improvement have been made. These steps are necessary to develop an orthosis which is useful and comfortable for the users.





## HyET

HyET is a growing high-tech company focused in renewable energy solutions, and it currently has HyET Solar and HyET Hydrogen as branches. The company is based in Arnhem, Netherlands, and hosts an international staff of innovative and professional workers who make the every-day experience a heel gezellig tijd. The internship task consisted in analysing the market of Hydrogen compressors and compare the business case of traditional technology against the innovative technology developed by HyET. Making a benchmark with current market provided insight on how to approach a cost-optimization, and it also served as a tool to present HyET's compressor as an attractive option, and the company itself as an interesting investment opportunity with potential to grow. However, this techno-economical analysis was not a desk-centred task. In order to obtain good insight and knowledge, much of the analysis was made and written in the workshop with the specialists building the compressors, asking and questioning relevant details from procedures to suppliers. All of this helped build a more accurate and grounded analysis.



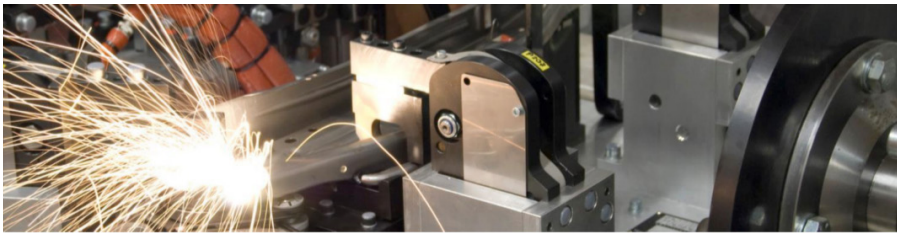
## IMS

IMS is a company that manufactures high end assembly lines. The subject of the internship was to investigate the applicability of stacked or serial manipulators for active alignment. Serial manipulators offer a lot of advantages in terms of design freedom and created room in the assembly line, but are traditionally known for their lower performance compared to parallel manipulators. Designing a test setup, validating the test setup, analysing the results and determining key design aspects for such manipulators require a broad set of skills developed during the study of mechanical engineering. The open minded attitude and general atmosphere at IMS are nice, which results in a great internship.



## MechDes Engineering

The tooling department of MechDes Engineering in Harderwijk designs welding jigs for the automotive industry. This internship was meant as preliminary research for a PhD project, and the exact internship assignment was determined during the internship. Part of the assignment was to create an overview of the current jig design process and the requirements a jig has to meet. The other part was to create a database of previous jigs and to design a standard template to use for all similar products. This involved a lot of research and discussions with many different professionals to ask for their experiences and opinions on the subject. Everyone was very helpful and enthusiastic about the project.



## NS

NS (Nederlandse Spoorwegen) is a Dutch state-owned company, and NS is the principal passenger railway operator in the Netherlands. NS exploits and maintains approximately 3,000 carriages. The maintenance program encompasses first-line service, running maintenance, and overhaul. The NS is improving their maintenance on their assets continuously, to lower their total expenses and ensure comfortable, reliable, and safe rolling stock. The DDZ (Dubbeldekker Zonering) is a series of double-deck trains maintained and operated by NS. They are a completely revised and modernized version of the double-decker slow trains (DDAR). The Heating, ventilation, and air conditioning (HVAC) one of the most used systems, and it is essential for the comfort of the traveler that the HVAC of the train is functioning. Thus, a data driven approach was implemented to monitor the condition of the HVAC unit to detect the failure of the HVAC unit. The steps involved in building such a condition monitoring system is described in the above figure.



## Super B

The picture below displays the main task of the internship that took place in “Super B”. The company is located in Hengelo, Netherlands, and designs and manufactures lithium-ion battery modules. The main task of the 3-months internship was assisting the mechanical engineer of the company with SolidWorks designs. The designs were about battery components, such as battery brackets (see Figure 1), special foam parts to keep the cells away from vibrations or designs of fixtures that could help with experiments with cells. Apart from SolidWorks designs, assist was also given to testing battery modules. More specifically, many experiments were conducted regarding condensation problems inside one of the batteries. The experiments were carried out using the climate chamber and putting the batteries inside in high temperature and humidity values.



*SolidWorks design of the bracket along with the battery (left) and ordered bracket with the case of the specific battery (right)*

## Suzlon Energy Limited

This internship was at Suzlon Energy Limited (SELN) in Hengelo (Ov.), where the blade design of wind turbines is done. For increasing size of wind turbines and blades, behaviour of lift, drag and moment have to be known at higher Reynolds numbers. However, these Reynolds numbers cannot always be achieved in wind tunnel measurements. Therefore, Reynolds number extrapolation methods are used to obtain the required data. Currently used methods have their shortcomings, which is why a new tool is developed, based on the evaluation of the currently used tools.

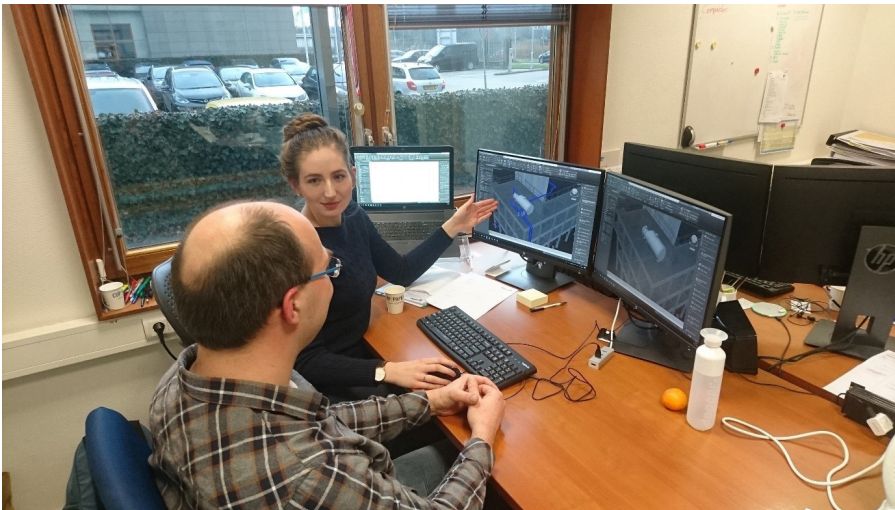
The experience at Suzlon was great! The working atmosphere was nice and there was a good collegiality. All in all, it was an educative and positive experience.





## Sweco

During this internship, a procedure for working with 3D software was assigned. A list of ten software programs is included in the procedure. At the start of this assignment, a short course in AutoCAD Plant 3D was arranged by Sweco to get some basic knowledge. Additionally, a checklist for 3D models was written, using information collected during interviews with employees from different departments. A checklist with items was made which must be included in a 3D model finishing at 30%, 60% and 90%. In the remaining time, some calculations were made while a pipe stress engineer, using knowledge about stress and materials obtained during the bachelor of Mechanical Engineering.



*A colleague and me talking about AutoCAD Plant 3D*

## Tegram

The student did his internship at Tegram, which is located in Zwolle, a city in the Netherlands. The company specializes in Vision Guided Robotics and implements this technology in a variety of projects. He worked with the robots to create a functionality which uses the companies EasyEye technology to spot products. As a developer he was busy with the structural aspects of the project, as well as creating and implementing algorithms used to control the robot.



## The Medicines Company

The intern was part of the Supply Chain management team of The Medicines Company (NASDAQ: MDCO) at Parsippany, NJ, USA. The sole purpose of The Medicines Company is to develop and market a LDLC lowering drug named Inclisiran. During the internship, the intern was part of multiple projects. The first was to make a tool which automatically provides a total MRP of the new drug Inclisiran. The second project was to assist during the contract negotiations with manufacturers of drug components. The last project was to set up a timeline for serialization implementation for Inclisiran. The internship provided a unique experience on a corporate level of a pharmaceutical company. At the end of the internship the Medicines Company was sold for 9.3 billion dollars which was a festive end.



## VIRO

From the 3rd of September till the 13th of December, the internship was performed at VIRO Hengelo. The core business of VIRO exists of project management and Engineering. This is spread out over 3 working areas: Product Engineering, Mechanical Engineering and Industrial Projects with branches in different market segments. Jolien her assignment was to design a high pressure module for the new lithography machine of chip producent ASML. The atmosphere within VIRO is jovial and everyone is willing to help. She did not feel like a student during this time, but just as a fellow worker. She had a great time.

## Waste Treatment Technologies

To reduce transportation costs of leachate (heavily contaminated wastewater), a small-scale on-site Wastewater Treatment Plant (WWTP) had to be designed to discharge leachate to the sewers. Using influent characteristics, effluent demands and available purifying techniques, the most optimal solution for a WWTP treating small volumes of strongly polluted wastewater has been found, occupying the least floor area possible.

The intern experienced a great 14 weeks at the company Waste Treatment Technologies, based in Oldenzaal. The company has a relatively flat management culture, and since the assignment addresses a very relevant topic for WTT, the colleagues were approachable and enthusiastic to answer any internship-related questions.



## Zenna Laser Solutions

Checking the position of the metal plates within the laser welding machine is done manually by placing markers using a measuring tape and a pen. A solution/design was needed to automate the process. The company, Zenna Laser Solutions, is located in Enschede, The Netherlands. It is a SME which produces large production lines/machines for its customers.

The interns have their own workplace among the employees, which gives a great insight how it goes within the company. However, every employee seems to be loaded with work and there is almost no time to discuss/brainstorm about certain ideas. Instead, a lot of decisions are made quickly, as one would expect within a SME.

